CLAIMS

What is claimed is:

1. A model predictive control system

a plurality of sensors indicating a current state of the system;

a desired trajectory generator for creating a desired dynamic response based upon commands;

a model of plant dynamics

starting with the current state of the system, a nonlinear programming module receiving the desired dynamic response and at least one system life goal and formulating a problem of achieving the desired dynamic response and the at least one system life goal for a window spanning one or more time steps as a solution to a nonlinear program problem using methods of model predictive control; and

a nonlinear programming solver solving the nonlinear programming problem in each time step using an iterative algorithm based upon the model predictive control problem and a nonlinear programming algorithm.

2. The model predictive control system of claim 1 wherein the at least one system life goal includes at least one limit

3. The model predictive control system of claim 2 wherein the plant dynamic model and limit equation are linear and the performance index is quadratic so as to form a quadratic programming problem and the nonlinear programming solver is replaced with a quadratic programming solver.

4. The model predictive control system of claim 3 wherein the at least one system life goal changes based upon a change in a status signal.

5. The model predictive control system of claim 4 wherein the status signal is generated by a sensor.

6. The model predictive control system of claim 4 wherein the status signal indicates the status of an actuator.

7. A method for controlling a multivariable system including the steps of:

a) receiving a plurality of sensor signals indicating current conditions of the system;

b) receiving a plurality of commands;

c) receiving at least one system life goal;

d) determining a desired dynamic response of the system based upon the commands; and

e) implementing a balance between the desired dynamic response and the at least one system life goal in a model predictive controller to generate a plurality of actuator commands.

8. The method of claim 7 wherein said step e) is performed by weighting in a performance index for the model predictive controller.

9. The method of claim 8 further including the step of changing the balance between the desired dynamic response and the at least one system life goal.

10. The method of claim 9 further including the step of changing the weighting in the performance index to change the balance.

11. The method of claim 10 further including the step of changing the weighting based upon an indication of a failure of a component in the system.

12. The method of claim 11 further including the step of changing the limit based upon an indication of a time-to-maintenance of the system.

13. The method of claim 10 wherein said step e) further includes the step of setting a limit in a set of inequality equations for the model predictive controller.

14. The method of claim 13 further including the step of changing the limit based upon an indication of a time-to-maintenance.

15. The method of claim 13 further including the step of changing the limit based upon an indication of a failure of a component in the system or the declaration of an emergency.

16. The method of claim 7 wherein said step e) further includes the step of setting a limit in a set of inequality equations for the model predictive controller.

17. The method of claim 16 further including the step of changing the limit based upon an indication of a time-to-maintenance.

18. The method of claim 16 further including the step of changing the limit based upon an indication of a failure of a component in the system or the declaration of an emergency.

19. A computer readable medium storing a computer program, which when executed by a computer performs the steps of:

a) receiving a plurality of sensor signals indicating current conditions of the system;

b) receiving a plurality of commands;

c) receiving at least one system life goal;

d) determining a desired dynamic response of the system based upon the commands; and

e) implementing a balance between the desired dynamic response and the at least one system life goal in a model predictive controller to generate a plurality of actuator commands.